(680); popular works, almanacs, 657 (642); fine arts, stenography, 627 (584); commerce, 583 (577); classical and oriental languages, archæology, mythology, 533 (481); modern languages, old German literature, 506 (485); agriculture, 433 (421); miscellaneous writings, 423 (378); architecture, railways, engineering, mines, and navigation, 403 (384); bibliography, encyclopædias, 377 (278); geography, travels, 356 (306); war, 353 (337); maps, 301 (300); mathematics, astronomy, 201 (158); philosophy, 125 (139); forests and game, 112 (103); freemasonry, 20 (21).

MESSRS. MACMILLAN AND CO. have in preparation, and will publish this year, "A Course of Instruction in Zootomy (Vertebrata)," by T. Jeffery Parker, B.Sc. Lond., Professor of Biology in the University of Otago. The work will consist of full directions for the dissection of the Lamprey, Skate, Cod, Lizard, Pigeon, and Rabbit, and will be illustrated by numerous woodcuts from the author's original drawings.

THE death is announced of Count Alexander Erdödy, a Member of the Pesth Academy of Sciences, vice-president of the Society for Plastic Art, and a liberal patron of science and art. His death occurred on January 24 at Vep (Hungary); he was eighty years of age.. We regret also to announce the death of Herr Gabriel Koch, a Frankfort tradesman and an eminent lepidopterist, whose "Schmetterlingsbuch" has a wide reputation in Germany. He died at Frankfort-on-Main on January 22, aged eighty. On February 2 died Prof. Gorini at Lodi, well known by his works on volcanic phenomena. He was a teacher at the Lodi High School, and one of the warmest advocates of cremation in Italy.

EARTHQUAKES continue at Berne. A new shock, directed from east to west, was felt in the north of the town on February 8, at 5.25 p.m. Shocks of earthquake are reported from Braila on February 11 at 7h. 15m. a.m., and from Galatz at the same time.

IT was not difficult to foresee that the warm weather which prevails now in the Alpine region, together with immense quantities of snow fallen during the previous days, would occasion several avalanches. On February 13 a terrible one descended from the slopes of Mont Pourri, and covered with a mass of snow, thirty feet deep, the village of Brévières, in the Tignes commune. Thirty-two persons were buried under the snow, and no less than three hundred peasants from the neighbourhood were engaged in sinking pits to reach the buried houses. Of the buried, twenty-five were found alive, four were dead, and three are not yet discovered. Two days later, another avalanche descended from the same mountain, and covered a space 10,000 metres wide, with a mass of snow fifteen to twenty metres deep. The pressure of air displaced by the avalanche was so great that all the windows of the village were broken within a few seconds. The quantity of snow fallen during the previous days was so great that all communication was broken up between Brévières village and the bottom of the valley; a peasant from Tignes took thirteen hours to reach the next town, Bourg-Saint-Maurice, travelling in the snow more than one metre deep.

THE provincial governments of Navarre and Logroño (Spain) have received the royal sanction to the necessary outlay for constructing and maintaining meteorological stations in these provinces.

OUR ASTRONOMICAL COLUMN

ENCKE'S COMET IN 1881.—So far as can be judged without the calculation of the perturbations since 1878 this comet will again arrive at perihelion about November 8 in the present year. In 1848, when the comet passed this point of its orbit on November 26, it was detected with the 15-inch refractor at Cambridge, U.S., on August 27, as "a misty patch of light, faint and without concentration : its light coarsely granulated, so that were it not for its motion it might be mistaken for a group of stars of the 21st magnitude" (Bond). The theoretical intensity of light at this time was 0·21, and we find that, assuming the perihelion passage to occur on November 8, the comet should have this degree of brightness soon after the middle of August next, so that it may be anticipated observations will be practicable with the waning moon about the 20th of that month. The last perihelion passage took place on July 26, 1878, the period of revolution at that time being 1200·58 days according to the late Dr. von Asten. The aphelion distance is 4·c879, the perihelion distance 0·3335, and the minor semi-axis 1·1675 (the earth's mean distance from the sun = 1). The approach to the orbit of the planet Mercury is still very close (0·031) in about 126°·5 heliocentric longitude. The nearest approximation of the two bodies that has occurred since the discovery of the comet's periodicity took place on November 22, 1848, when their distance was only 0·038. It is known that from his investigations on the motion of Encke's comet, von Asten inferred a much smaller value for the mass of Mercury than had been previously assigned, viz. $\frac{1}{7636440}$.

CINCINNATI MEASURES OF DOUBLE STARS.—Mr. Ormond Stone has issued an important series of measures of double stars made at the Observatory of Cincinnati, which is under his superintendence, between January 1, 1878, and September 1, 1879. The number of stars measured is 1054, of which 622 are south, and 432 north of the celestial equator : 560 belong to Struve's catalogue, 171 were discovered by the Herschels, 162 by Mr. Burnham, and 85 were found with the Cincinnati refractor, which has an aperture of eleven inches. The measures of the southern stars have a special interest, as there are comparatively few previous ones upon record. In his introduction Mr. Stone points out the most notable differences between the Cincinnati measures of angle and distance, and those of Struve, Sir John Herschel, and others; we shall refer to several of these cases in a future column. The volume is published by the Board of Directors of the University of Cincinnati, and will be a necessary addition to the libraries of those who are making the double stars their special study. Mr. Stone acknowledges his obligation to the Manual of Double Stars lately published by Messrs. Crossley, Gledhill, and Wilson, and M. Flammarion's "Catalogue des Étoiles Doubles et Multiples en Mouvement relatif certain."

THE MINOR PLANETS IN 1881.—The usual supplement to the *Berliner astronomisches Jahrbuch* (1883), containing its specialty, elements and ephemerides of the small planets for the present year, has been issued. We have in it approximate ephemerides for every twentieth day throughout the year of 210 planets, the latest being No. 217, and accurate opposition ephemerides of 58. Three planets are omitted for want of proper data for computation, viz. No. 99 *Dike*, No. 155 *Scylla*, and No. 206 *Hersilia*. A glance at this long series of ephemerides shows how wide a range over the heavens the apparent tracks of these small bodies present : thus we find *Euphrosyne* in opposition in 52½° south declination, in the constellation Indus, and *Niobe* in the vicinity of ζ Persei, with 43° north declination. A favourable opportunity for repeating observations for determination of the solar parallax would have been afforded if, in the first place, the actual position of No. 132 *Æthra* were pretty accurately known, and if Mr. Gill were able to utilise his heliometer at the Cape of Good Hope : this planet on February 28 being distant from the earth less than 0·84 of the earth's mean distance from the sun, with 47° south declination and rather greater brightness than a star of the ninth magnitude.

CHEMICAL NOTES

HAUTEFEUILLE AND CHAPPUIS state (*Comptes rendus*) that when a high tension spark is passed through a mixture of nitrogen and oxygen, ozone and "pernitric acid" are produced, but the latter compound is readily decomposed with production of a less oxygenated body and oxygen. When the electric discharge is passed through air in presence of water vapour very noticeable quantities of nitric acid are formed. The same observers have examined the absorption-spectrum of ozone and have recognised certain bands which they state are also found in the solar

spectrum. They think that the blue colour of the sky may probably be partly due to the presence of ozone.

BRAME (in *Comptes rendus*) recommends the use of baryta in place of sodium carbonate and charcoal, in the ordinary dry test for arsenic. If arsenious oxide is heated with baryta a mirror is obtained consisting partly of metallic arsenic, and partly of barium arsenate : the test does not succeed so well with arsenious sulphide.

A CONSIDERABLE deposit of crystallised (octahedral) sulphur has been found under the soil of Paris, where organic refuse matter has long accumulated. The sulphur appears to be a product of the deoxidising action of the carbon compounds present in the refuse on the calcium sulphate of the soil.

M. LOUGHININ continues, in the *Journal* of the Russian Chemical Society, his interesting researches on the quantities of heat produced by burning alcohols of the allyl series ; he publishes in the *Journal* the figures corresponding to two new bodies of this series ($C_9H_{12}O$ and $C_{10}H_{20}O$), which figures, together with those he has already published in the *Comptes rendus* (vol. xci.), allow him to draw a complete table of the calories disengaged by the whole of the alcohols of this series.

THE first number of the *Gazetta Chimica Italiana* for the present year is devoted, with the exception of a paper by M. Fileti on gas analysis, to papers on organic chemistry : these include work on Camphor Derivatives by Schiff; on Picrotoxin by Paterno and Oglialoro ; and on Synthesis of Aromatic Aldehydes by the use of Chromyl Dichloride, by Paterno and Scichiloni.

IN the course of a paper on the Photo-chemistry of Silver Chloride, Eder states (in *Wien. Akad. Ber.*) that this substance is more sensitive to light when substances which absorb chlorine are present, than when in the pure state. To develop the latent image he recommends especially ammonium ferrocitrate, and hydroquinone along with ammonium carbonate.

BY the action of potassium dichromate and sulphuric acid on caffeine, Hinteregger has obtained as much as 40 per cent. of dimethyl parabanic acid, and 39 per cent. of the monomethyl acid from theobromine.

IN continuation of his investigations into the action of hydrochloric acid on metallic chlorides, Ditte describes (*Compt. rend.*) several new hydrated salts which crystallise from aqueous solutions when these are saturated with hydrochloric acid. In the absence of hydrochloric acid hydrated salts with more water of crystallisation are always produced. The following table contains the principal results obtained by Ditte :—

Aqueous solution.		Solution saturated with HCl at 12°.	
Grams of salt dissolved per litre.	Crystals which form	Grams of salt dissolved per litre.	Crystals which form
700 …	$CaCl_2.6H_2O$	270 …	$CaCl_2.2H_2O$
500 …	$SrCl_2.6H_2O$	20 …	$SrCl_2.2H_2O$
720 …	$MgCl_2.6H_2O$	65 …	$MgCl_2.2H_2O$
415 …	$CoCl_2.6H_2O$	205 …	$2CoCl_2.3H_2O$ and $CoCl.H_2O$
600 …	$NiCl_2.6H_2O$		
870 …	$MnCl_2.4H_2O$	40 …	$NiCl_2.H_2O$
630 …	$CuCl_2.2H_2O$	190 …	$MnCl_2.H_2O$
		290 …	$CuCl_2.H_2O$

M. POUCHET describes in *Compt. rend.* a method for destroying organic matter before testing for mineral poisons in contents of a stomach, &c. ; the method is based on the oxidising action of potassium-hydrogen sulphate followed by addition of sulphuric acid.

PHYSICAL NOTES

IN a little mathematical note in the *Comptes rendus* M. Thollon investigates the general equation for the passage of light through a prism, and thence deduces the proposition that for every prism there is an angle of minimum resolving power. Differentiating the general equation with respect to the index of refraction, he obtains, first, a differential equation expressing the dependence of the angular distance between two rays upon the dispersive index. A separate differentiation with respect to the angle of incidence yields a second differential equation expressing the dependence of the apparent width of the slit as seen through the prism upon the angular aperture of the slit, as viewed from the prism through the collimator. Hence a relation can be obtained between the angular distance between two rays and their apparent

breadth. Further examination of the equations shows that for a certain incidence there will be a minimum of resolution (*i.e.* an incidence at which the rays are least well defined), and that for another incidence there will be a minimum of dispersion ; these two incidences being symmetrically related to the angle of incidence corresponding to minimum deviation. M. Thollon states that these deductions may be readily verified by the following experiment :—A dense flint glass prism is adjusted in the position of minimum deviation for the rays D upon its supporting table in the spectroscope, lit by a sodium flame. The slit is then narrowed or widened until the two yellow rays are just in mutual contact. On then turning the prism around its axis so as to increase the angle of incidence the two rays are seen to separate and to become perfectly distinct, *the angular distance between them diminishing all the while.* But if the prism be turned in the opposite direction, so as to decrease the angle of incidence, the yellow band is seen to become wider, but without being resolved into two rays. Perhaps this research may explain why the so-called "half prism" spectroscope failed to realise all the hopes of its inventor.

RECENT observations by Hrn. Wüllner and Grotrian (*Wied. Ann.* No. 12) seem to prove that the specific volume of vapours is independent of the size of the space in which it is determined. They also confirm Herr Herwig's result, that vapours always undergo precipitation before reaching the so-called maximum tension. Further, the tension at which condensation begins is found to have a relation to the maximum tension, which depends on the nature of the liquid, but is nearly independent of the temperature. Experiments made in order to find in what measure vapour must be compressed so as to present maximum tension, gave the unexpected result, that there is in general no maximum tension in the sense hitherto accepted ; but that the tension of saturated vapours, even when they are in contact with a large and excessive quantity of liquid, is perceptibly increased by compression.

THE varieties of the electric discharge in gases are fully investigated by Herr Lehmann in a recent paper (*Wied. Ann* No. 12). The chief conclusion is that there are four well-characterised modes of discharge to be distinguished, viz. glow, brush, band, and spark discharge; and these may all be obtained in air of ordinary (as well as of less) density, and also in other gases, with inserted resistances and breaks, and with sharp and rounded form of electrodes, at great or small distances. The principal characteristics are these :—1. Glow-discharge ; positive glow, negative light pencil, consisting of two parts separated by a dark space. 2. Brush-discharge ; positive brush, consisting of stem and branches ; negative light-pencil. 3. Band-discharge ; positive light with two places of intermittence, sometimes stratified, and separated from the negative glow by a dark space. 4. Spark-discharge : band of light connecting both electrodes ; with two places of intermittence, brushes of metallic vapour at both ends, the positive longer, the negative thicker ; sometimes oblique dark spaces.

THE influence of traction and vibrations of a metallic wire on its electric conductivity is the subject of a paper by Dr. De Marchi in the *Reale Ist. Lomb. Rend.* (vol. xiii. fasc. xix.). The results he arrives at are summed up thus : 1. Any traction of a metallic wire increases in general its resistance ; when the traction is very slight however there is diminution instead of increase ; with increase of traction the case comes under the general law. 2. In general the increments are proportional to the increments of traction, up to a certain limit, beyond which the variations of resistance are manifested in sudden bounds, indicating an instantaneous and profound perturbation of the molecular state of the wire. 3. The law of increments of resistance is apparently independent of that of the elongations. 4. Any vibration of a wire is accompanied by a variation of resistance generally very perceptible. In most cases there is decrease of resistance if the vibration be sonorous, and more so if harmonic; increase, if the vibration be silent. This last law however requires confirmation.

IT is known that M. Plateau distinguishes between an internal and a surface viscosity of liquids, a distinction which Signor Marangoni does not consider warranted. Herr Oberbeck (*Wied. Ann.* No. 12) has approached the question experimentally thus : A brass cross is hung bifilarly with two platinum wires by one arm ; its horizontal arms carry weights whose positions can be varied by screwing, so as to vary the swing ; it carries a mirror reflecting a scale, and to the lower arm is attached a thin plate